Air Quality Permitting
Statement of Basis

March 14, 2006

Permit to Construct No. P-050049

G2 Energy LLC
Boise, ID

Facility ID No. 001-00214

Prepared by:

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AIR QUALITY DIVISION

FINAL

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Acronyms, Units, and Chemical Nomenclatures

AFS	AIRS Facility Subsystem
AIRS	Aerometric Information Retrieval System
AQCR	Air Quality Control Region
ASTM	American Society for Testing and Materials
BACT	Best Available Control Technology
CAA	Clean Air Act
CFR	Code of Federal Regulations
CO	carbon monoxide
DEQ	Department of Environmental Quality
dscf	dry standard cubic feet
EPA	U.S. Environmental Protection Agency
HAPs	Hazardous Air Pollutants
IDAPA	a numbering designation for all administrative rules in Idaho promulgated in accordance with the Idaho Administrative Procedures Act
km	kilometer
lb/hr	pound per hour
MACT	Maximum Achievable Control Technology
MMBtu	million British thermal units
NESHAP	National Emission Standards for Hazardous Air Pollutants
NO_2	nitrogen dioxide
NSPS	New Source Performance Standards
O_3	ozone
PM	particulate matter
PM_{10}	particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers
PSD	Prevention of Significant Deterioration
PTC	permit to construct
PTE	potential to emit
Rules	Rules for the Control of Air Pollution in Idaho
SIC	Standard Industrial Classification
SIP	State Implementation Plan
SM	Synthetic Minor
SO_2	sulfur dioxide
T/yr	tons per year
$\mu g/m^3$	micrograms per cubic meter
UTM	Universal Transverse Mercator
VOC	volatile organic compound

1. PURPOSE

The purpose for this memorandum is to satisfy the requirements of IDAPA 58.01.01.200, Rules for the Control of Air Pollution in Idaho, for issuing permits to construct.

2. FACILITY DESCRIPTION

G2 Energy LLC operates a landfill gas to energy facility utilizing landfill gas from the Ada County Hidden Hollow Sanitary Landfill as fuel for two 1.6-megawatt (MW) generators.

3. FACILITY / AREA CLASSIFICATION

This facility is classified as a synthetic minor facility because enforceable operational limits limit the facility's potential to emit to less than Tier I operating permit major source thresholds. The AIRS facility classification is "SM80" because the facility's potential to emit is greater than or equal to 80% of the major source threshold level(s). The SIC code defining this facility is 4911 (Electric Services).

This facility is located within AQCR 64 and UTM zone 11. The facility is located in Ada County, which is designated as an unclassifiable area for all criteria air pollutants.

The AIRS information provided in Appendix A defines the classification for each regulated air pollutant at the facility. This required information is entered into the EPA AIRS database.

4. APPLICATION SCOPE

This permitting action is for the construction of (2) 1.6-megawatt (MW) generators. The generators will use landfill gas generated from the Ada County Hidden Hollow Landfill Cell (HHLC). Each generator is limited to 12,894,720 kilowatts (kW) of power production per any 12 month consecutive period in order to limit CO emissions to 99 T/yr.

4.1 Application Chronology

October 27, 2005	DEQ received application
November 18, 2005	DEQ determined application complete
December 29, 2005	Draft permit sent to Boise Regional Office
January 9, 2006	Comments were received from Boise Regional Office
January 17, 2006	DEQ sent draft permit sent to facility
March 8, 2006	DEQ received permit processing fee

5. PERMIT ANALYSIS

This section of the Statement of Basis describes the regulatory requirements for this PTC action:

5.1 Equipment Listing

- (2) 1.6-megawatt (MW) generators, model No. G3520C, manufactured by Caterpillar
- Compressor skid assembly consisting of a landfill gas control valve to regulate total vacuum placed on the collection system and a positive displacement landfill blower to pressurize and compress the landfill gas
- A filter/separator to remove condensate and particulate contaminants from the gas
- Air actuated automatic shut-off valve
- Flowmeter and flowrate recorder
- Temperature recorder
- Continuously recording gas chromatograph

5.2 Emissions Inventory

The criteria pollutants emissions of PM_{10}, SO_2, NO_2, and CO are summarized below in Table 5.1 summary of TAP emissions exceeding AAC or AACC EL values are summarized below in Table 5.2 detailed emissions inventory has been included in Appendix B.

Table 5.1 EMISSIONS SUMMARY

Source	NO_2		SO_2		CO		PM_{10}	
	lb/hr	T/y	lb/hr	T/y	lb/hr	T/y	lb/hr	T/y
Gen1	4.92	19.84	0.20	0.85	12.31	49.59	1.45	5.83
Gen2	4.92	19.84	0.20	0.85	12.31	49.59	1.45	5.83
Flare1	0.05	0.21	0.60	2.6	0.16	0.72	0.03	0.15
Flare2	0.05	0.21	0.60	2.6	0.16	0.72	0.03	0.15

Table 5.2 EMISSIONS SUMMARY

Pollutant	Generators	
	lb/hr	T/y
1,1,2,2-Tetrachloroethane	1.10E-05	0.0061
1,1-Dichloroethane (ethylidene dichloride)	2.50E-04	.0076
1,1-Dichloroethene (vinylidene chloride)	1.30E-04	.0006
1,2-Dichloroethane (ethylene dichloride)	2.50E-04	.0013
Acrylonitrile	9.8E-05	.0141
Dichloromethane (methylene chloride)	1.60E-03	.0398
Perchloroethylene (tetrachloroethylene)	1.30E-02	.0203
Trichloroethylene	5.10E-04	0.0121
Vinyl chloride	9.40E-04	0.0150
Benzene	8.00E-04	0.0063

5.3 Modeling

The facility has demonstrated to the satisfaction of DEQ that air pollutant emissions associated with this project will not cause or contribute to a violation of any applicable ambient air quality standard. TAPs listed in Table 5.4 were modeled because their proposed emission rates exceeded the EL values of IDAPA 58.01.01.586. No significant contribution level values were given by the facility for the pollutants NO_2, SO_2, CO, or PM_{10}. However, the facility provided a full impact analysis on these pollutants. A summary of all modeling results have been provided in Table 5.3 and 5.4. A detailed modeling analysis has been included in Appendix C of this statement of basis.

Table 5.3 MODELING ANALYSIS SUMMARY

Pollutant	Averaging Period	Concentration (ug/m3)	Background (ug/m3)	Overall Conc. (ug/m3)	NAAQs (ug/m3)
NO_2	Annual	4.40	40	44.4	100
SO_2	Annual	0.69	10	10.7	80
SO_2	24-Hour	7.03	40	47.0	365
SO_2	3-Hour	26.83	120	146.8	1300
CO	1-Hour	1,748.25	12,249	13,997.2	40,000
CO	8-Hour	309.60	6,754	7063.6	10,000
PM10	24-Hour	17.47	73	90.5	150
PM10	Annual	1.31	26	27.3	50

Table 5.4 MODELING ANALYSIS SUMMARY

Pollutant	Est. Total Concentration in ug/m3	AAC/AACC Standards in ug/m3	Below/Exceeds AAC/AACC Standards?
	Annual	Annual	Annual
1,1,2,2-Tetrachloroethane	0.00299	1.70E-02	Below
1,1-Dichloroethane (ethylidene dichloride)	0.00367	3.80E-02	Below
1,1-Dichloroethene (vinylidene chloride)	0.00031	2.00E-02	Below
1,2-Dichloroethane (ethylene dichloride)	0.00064	3.80E-02	Below
Acrylonitrile	0.00679	1.50E-02	Below
Dichloromethane (methylene chloride)	0.01918	2.40E-01	Below
Perchloroethylene (tetrachloroethylene)	0.00977	2.1000	Below
Trichloroethylene	0.00585	0.7700	Below
Vinyl chloride	0.00724	1.40E-01	Below
Benzene	0.00302	1.20E-01	Below

5.4 *Regulatory Review*

This section describes the regulatory analysis of the applicable air quality rules with respect to this PTC.

IDAPA 58.01.01.201 ..... Permit to Construct Required

The facility's proposed project does not meet the permit to construct exemption criteria contained in Sections 220 through 223 of the Rules. Therefore, a PTC is required.

IDAPA 58.01.01.203 ..... Permit Requirements for New and Modified Stationary Sources

The applicant has shown to the satisfaction of DEQ that the facility will comply with all applicable emissions standards, ambient air quality standards, and toxic increments.

IDAPA 58.01.01.210 ..... Demonstration of Preconstruction Compliance with Toxic Standards

The applicant has demonstrated preconstruction compliance for all TAPs identified in the permit application.

IDAPA 58.01.01.224 ..... Permit to Construct Application Fee

The applicant satisfied the PTC application fee requirement by submitting a fee of $1,000.00 at the time the original application was submitted, September 1, 2005.

IDAPA 58.01.01.225 ..... Permit to Construct Processing Fee

The total emissions from the proposed new facility are between 10 and 100 T/yr; therefore, the associated processing fee is $7,500.00. No permit to construct can be issued without first paying the required processing fee. The processing fee was paid March 8, 2006.

5.5 *Permit Conditions Review*

This section describes those permit conditions that have been developed as a result of this permit action.

Permit Condition 2.3 contains the emission limits for CO. CO has been included in the permit because the facility has requested to be permitted to 99 T/yr. There is no regulatory basis on which to impose requirements on the SO_2, PM_{10}, NO_X, and VOCs emissions of the facility.

Permit Condition 2.4 contains the visible emission requirements for the generators. Permit Conditions 2.5, 2.6 and General Provision 2 establish the requirements necessary to demonstrate compliance with opacity limit of Permit Condition 2.4.

Permit Condition 2.5 has been established to assure compliance with CO emissions limit in Permit Condition 2.3 and the AACC values of IDAPA 58.01.01.586.

Permit Conditions 2.6 and 2.7 contain the operating, monitoring, and recordkeeping requirements necessary to demonstrate compliance with the operating limit of Permit Condition 2.5.

6. PERMIT FEES

The PTC application fee was received on November 27, 2005. In accordance with IDAPA 58.01.01.225, a permit to construct processing fee of $7,500 is due, and was paid on March 8, 2006.

Table 6.1 PTC PROCESSING FEE TABLE

Emissions Inventory			
Pollutant	**Annual Emissions Increase (T/yr)**	**Annual Emissions Reduction (T/yr)**	**Annual Emissions Change (T/yr)**
NO_X	39.67	0	39.67
SO_2	1.7	0	1.7
CO	99.18	0	99.18
PM_{10}	11.67	0	11.67
VOC	8.1	0	8.1
TAPS/HAPS	2.7	0	2.7
Total:	163.02	0	**163.02**
Fee Due	**$ 7,500.00**		

7. PERMIT REVIEW

7.1 *Regional Review of Draft Permit*

A draft copy of the permit was provided to the Boise Regional Office on December 29, 2005. Comments were received on January 4, 2006 and incorporated as requested.

7.2 *Facility Review of Draft Permit*

A draft copy of the permit was provided to the facility on January 17, 2006. No comments were received.

7.3 Public Comment

An opportunity for public comment period on the PTC application was provided from December 1, 2005 to January 3, 2006 in accordance with IDAPA 58.01.01.209.01.c. During this time, there were no comments on the application and no requests for a public comment period on DEQ's proposed action.

8. RECOMMENDATION

Based on review of application materials, and all applicable state and federal rules and regulations, staff recommend that G2 Energy LLC be issued final PTC No. P-050049 for the installation of two 1.6MW generators. No public comment period is recommended, no entity has requested a comment period, and the project does not involve PSD requirements.

AC/bf Permit No. P-050049

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Appendix A

AIRS Information

P-050049

AIRS/AFS[a] FACILITY-WIDE CLASSIFICATION[b] DATA ENTRY FORM

Facility Name: G2 Energy LLC
Facility Location: Boise, Idaho
AIRS Number: 001-00214

AIR PROGRAM / POLLUTANT	SIP	PSD	NSPS (Part 60)	NESHAP (Part 61)	MACT (Part 63)	SM80	TITLE V	AREA CLASSIFICATION A-Attainment U-Unclassified N- Nonattainment
SO_2	B							
NO_x	B							
CO	SM					SM80		
PM_{10}	B							
PT (Particulate)	B							
VOC	B							
THAP (Total HAPs)	B							
			APPLICABLE SUBPART					

[a] Aerometric Information Retrieval System (AIRS) Facility Subsystem (AFS)

[b] AIRS/AFS Classification Codes:

A = Actual or potential emissions of a pollutant are above the applicable major source threshold. For HAPs only, class "A" is applied to each pollutant which is at or above the 10 T/yr threshold, or each pollutant that is below the 10 T/yr threshold, but contributes to a plant total in excess of 25 T/yr of all HAPs.

SM = Potential emissions fall below applicable major source thresholds if and only if the source complies with federally enforceable regulations or limitations.

B = Actual and potential emissions below all applicable major source thresholds.

C = Class is unknown.

ND = Major source thresholds are not defined (e.g., radionuclides).

Appendix B

Emissions Inventory

P-050049

G2 Energy - Hidden Hollow Landfill Cell - Ada County Landfill, Boise
Summary of Potential Emissions

Total electric output of 3300 kWhr and 28,788,440 kWhr

Criteria Pollutants:

Pollutant	Emission Rate	
	IC Engines	
	(lb/hr)	(T/yr)
PM_{10}	2.9	11.7
NO_x	8.8	38.7
CO	24.8	99.2
SO_2	0.4	1.7
VOC	1.8	8.1

Note:
Lead emissions are not estimated by LANDGEM nor is it listed in EPA AP-42 Section 2.4 Municipal Solid Waste Landfills as a landfill gas constituent. Therefore, we assume that the emissions are zero for this pollutant.

Hazardous Air Pollutants:

Pollutant	HAP/VOC	CAS No.	IC Engines		IDAPA 58.01.01.000000	Comparison
			Clb/hr	Clb/Tyr	lb/hr	
1,1,1-Trichloroethane (methyl chloroform)	HAP	71-55-6	0.0021	0.009	127	Below
1,1,2,2-Tetrachloroethane	HAP/VOC	79-34-5	0.0061	0.027	1.10E-05	Exceeds
1,1-Dichloroethane (ethylidene dichloride)	HAP/VOC	75-34-3	0.0076	0.033	2.60E-04	Exceeds
1,1-Dichloroethene (vinylidene chloride)	HAP/VOC	75-35-4	0.0005	0.003	1.30E-04	Exceeds
1,2-Dichloroethane (ethylene dichloride)	HAP/VOC	107-06-2	0.0013	0.006	2.50E-04	Exceeds
1,2-Dichloropropane (propylene dichloride)	HAP/VOC	78-87-5	0.0007	0.003	23.133	Below
2-Propanol (isopropyl alcohol)	VOC	67-63-0	0.1282	0.553	65.30	Below
Acetone	*	67-64-1	0.0171	0.075	119	Below
Acrylonitrile	HAP/VOC	107-13-1	0.0141	0.062	9.80E-05	Exceeds
Bromodichloromethane	VOC	75-27-4	0.0168	0.074		
Butane	VOC	106-97-8	0.0123	0.054		
Carbon disulfide	HAP/VOC	75-15-0	0.0019	0.008	2	Below
Carbon tetrachloride	HAP/VOC	56-23-5	0.0000	0.000	4.40E-04	Below
Carbonyl sulfide	HAP/VOC	463-58-1	0.0009	0.004	0.027	Below
Chlorobenzene	HAP/VOC	108-90-7	0.0009	0.004	23.3	Below
Chlorodifluoromethane	VOC	75-45-6	0.0037	0.016		
Chloroethane (ethyl chloride)	HAP/VOC	75-00-3	0.0026	0.012	176	Below
Chloroform	HAP/VOC	67-66-3	0.0001	0.001	2.90E-04	Below
Chloromethane (methylchloride)	HAP/VOC	74-87-3	0.0009	0.008		
Dichlorobenzene	HAP/VOC	95-50-1	0.0010	0.004	20	Below
Dichlorodifluoromethane	VOC	75-71-8	0.0622	0.272		
Dichlorofluoroethane	VOC	75-43-4	0.0068	0.030	2.67	Below
Dichloromethane (methylene chloride)	HAP	75-09-2	0.0398	0.174	1.60E-03	Exceeds
Dimethyl sulfide (methyl sulfide)	VOC	75-18-3	0.0132	0.058		
Ethane	VOC	74-84-0	1.1208	4.908		
Ethanol	VOC	64-17-5	0.0525	0.230	125	Below
Ethyl mercaptan (ethanethiol)	VOC	75-08-1	0.0089	0.026	0.057	Below
Ethylbenzene	HAP/VOC	100-41-4	0.0205	0.090	29	Below
Ethylene dibromide	HAP/VOC	106-09-4	0.0000	0.000	3.00E-06	Below
Fluorotrichloromethane	VOC	75-69-4	0.0034	0.015		
Hexane	HAP/VOC	110-54-3	0.0237	0.104	12	Below
Hydrogen sulfide	*	7783-06-4	0.0329	0.144	0.033	Below
Mercury (total)	HAP	7439-97-6	0.0000	1.08E-06	0.007	Below
Methyl ethyl ketone (MEK)	HAP/VOC	78-93-3	0.0214	0.094	39.3	Below
Methyl isobutyl ketone (MIBK)	HAP/VOC	108-10-1	0.0079	0.034	13.7	Below
Methyl mercaptan	VOC	74-93-1	0.0060	0.027	0.033	Below
Pentane	VOC	109-66-0	0.0160	0.044	118	Below
Perchloroethylene (tetrachloroethylene)	HAP/VOC	127-18-4	0.0203	0.089	1.30E-02	Exceeds
Propane	VOC	74-98-6	0.0285	0.060		
trans-1,2-Dichloroethene	VOC	540-59-0	0.0080	0.035	52.7	Below
Trichloroethylene	HAP/VOC	79-01-6	0.0121	0.053	5.10E-04	Exceeds
Vinyl chloride	HAP/VOC	75-01-4	0.0160	0.070	9.40E-04	Exceeds
Xylenes	HAP/VOC	1330-20-7	0.0539	0.236	29	Below
Benzene No or unknown co-disposal	HAP/VOC	71-43-2	0.0063	0.027	8.00E-04	Exceeds
Toluene No or unknown co-disposal	HAP/VOC	108-88-3	0.1518	0.665	26	Below
Hydrocloric Acid	HAP	7647-01-0	0.2018	0.884		
		HAP total	0.5163	2.7		
		VOC total	1.5436	8.1		

Notes:
* Not classified as HAP or VOC

G2 Energy - Hidden Hollow Landfill Cell - Ada County Landfill, Boise
Potential to Emit for Gas IC Generators

Manufacturer Information[a]:

Manufacturer	Caterpillar
Model No.	G3520C
Engine Power Rating-100 % load (kW)	1,600
Engine Power Rating 100 % load (bhp)	2,269
Fuel Consumption 100% load(lb/kWe-hr)	8.199
Maximum Heat Input Rating (Btu/hr)	13,758,041
Maximum Hours of Operation	8,760
Heat Value of Fuel (Btu/scf)	450
Max Firing rate (scf/hr)	30,350
Electric output (kWh/yr)	1,600
Proposed yearly electric output (kWh/yr)	12,804,720
Fuel Type	Low Energy (1.49 Qty, CO2, etc)

power output under

Proposed operating limit for each generator

Criteria Pollutants

Pollutant	AP-42 EF[b] (lb/MMBtu dual CHG)	CAT EF[a] (g/bhp-hr)	100%		90%		Total	
			lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
PM	9.9		1.45	6.35	1.45	6.35	2.90	11.87
CO		2.50	12.31	49.58	12.31	49.58	24.61	99.16
NOx		1.00	4.92	19.84	4.92	19.84	9.84	39.67

Notes:

[a] Manufacturer emission factors are specifications from Caterpillar, Caterpillar spec

[b] AP-42 emission factors from Section 3.2-1, Table 3.2-3 (5/00 version Caterpillar data)

Appendix C

Modeling Review

P-050049

M E M O R A N D U M

DATE: December 29, 2005

TO: Almer Casile, Permit Writer, Air Program

THROUGH: Kevin Schilling, Stationary Source Modeling Coordinator, Air Program

FROM: Darrin Mehr, Air Quality Analyst, Air Program

PROJECT NUMBER: P-050049

SUBJECT: Modeling Review for G2 Energy LLC 15-day Permit to Construct Application for their facility near Boise, Idaho.

1.0 SUMMARY

G2 Energy LLC (G2 Energy) submitted a 15-day Pre-Permit to Construct (PTC) application for two 1.6 megawatt (MW) generators to be fired on landfill gas collected at the Ada County Hidden Hollow Sanitary Landfill near Boise, Idaho. Air quality analyses involving atmospheric dispersion modeling of emissions associated with the facility were submitted in support of a permit application to demonstrate that the facility would not cause or significantly contribute to a violation of any ambient air quality standard (IDAPA 58.01.01.203.02).

A technical review of the submitted air quality analyses was conducted by DEQ. The submitted modeling analyses in combination with DEQ's staff analyses: 1) utilized appropriate methods and models; 2) was conducted using reasonably accurate or conservative model parameters and input data; 3) adhered to established DEQ guidelines for new source review dispersion modeling; 4) showed that predicted pollutant concentrations from emissions associated with the facility, when appropriately combined with background concentrations, were below applicable air quality standards at all receptor locations. Table 1 presents key assumptions and results that should be considered in the development of the permit.

Table 1. KEY ASSUMPTIONS USED IN MODELING ANALYSES

Criteria/Assumption/Result	Explanation/Consideration
The full ambient impact analysis was conducted by the applicant for the two proposed landfill gas-fired generator engines and the Hidden Hollow Sanitary Landfill's (HHSLF) two existing flares. The existing flares are located close to the location of the proposed generators and the ambient air boundary for the proposed landfill gas-fired generators was the same as for the HHSLF facility. Facility-wide NAAQS compliance was demonstrated to the satisfaction of the Department	G2 Energy is an independent corporation that will operate the proposed landfill gas-fired generators on the HHSLF facility. An outside contractor operates a wood chipper and a materials separation screen, which are fugitive sources. Two portable diesel-fired generators provide power to the chipper and screen. The chipper, screen, and portable generators were not required to be included in the modeling demonstration due to the distance between the proposed landfill gas-fired generators and the chipping and screening sources.
Base elevation values used by G2 Energy for GEN1 and GEN2 were 2939 feet. The site plan (Figure 2) included with the application indicates the generators and the existing flares all have a base elevation of 2870 feet. DEQ verification modeling for criteria pollutants with short-term averaging periods used base elevations of 2870 feet for all sources.	DEQ used the support information supplied in the application to determine if the ambient impacts would be affected by source base elevations for discrete ambient air receptors with elevations greater than emission source base elevations. The discrete receptors located to the north, southeast and east of the generator and flare pad have higher elevations than the generator and flare sources. The predicted ambient impacts were not significantly affected by reducing the base elevations for the generators.
The landfill gas collection system at HHSLF is designed to collect 4000 standard cubic feet per minute (scfm) of landfill gas. The generator engines (combined) will combust up to 1005 scfm of landfill gas and the flares will combust up to 2995 scfm of the landfill gas.	Emissions rates for the generators and flares are linearly dependent upon the quantities of the landfill gas collected by the existing system.

2.0 BACKGROUND INFORMATION

2.1 Applicable Air Quality Impact Limits and Modeling Requirements

This section identifies applicable ambient air quality limits and analyses used to demonstrate compliance.

2.1.1 Area Classification

The G2 Energy facility is located in Ada County, designated as an attainment or unclassifiable area for sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), lead (Pb), ozone (O_3), and particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers (PM_{10}). The area operates under limited maintenance plans for PM_{10} and CO. There are no Class I areas within 10 kilometers of the facility.

2.1.2 Significant and Full Impact Analyses

If estimated maximum pollutant impacts to ambient air from the emissions sources at the facility exceed the significant contribution levels (SCLs) of IDAPA 58.01.01.006.91, then a full impact analysis is necessary to demonstrate compliance with IDAPA 58.01.01.203.02. A full impact analysis for attainment area pollutants involves adding ambient impacts from facility-wide emissions to DEQ-approved background concentration values that are appropriate for the criteria pollutant/averaging-time at the facility location and the area of significant impact. The resulting maximum pollutant concentrations in ambient air are then compared to the National Ambient Air Quality Standards (NAAQS) listed in Table 2. Table 2 also lists SCLs and specifies the modeled value that must be used for comparison to the NAAQS.

Table 2. CRITERIA AIR POLLUTANTS APPLICABLE REGULATORY LIMITS

Pollutant	Averaging Period	Significant Contribution Levels[a] ($\mu g/m^3$)[b]	Regulatory Limit[c] ($\mu g/m^3$)	Modeled Value Used[d]
PM_{10}[e]	Annual	1.0	50[f]	Maximum 1st highest[g]
	24-hour	5.0	150[h]	Maximum 6th highest[i]
Carbon monoxide (CO)	8-hour	500	10,000[j]	Maximum 2nd highest[g]
	1-hour	2,000	40,000[j]	Maximum 2nd highest[g]
Sulfur Dioxide (SO_2)	Annual	1.0	80[f]	Maximum 1st highest[g]
	24-hour	5	365[j]	Maximum 2nd highest[g]
	3-hour	25	1,300[j]	Maximum 2nd highest[g]
Nitrogen Dioxide (NO_2)	Annual	1.0	100[f]	Maximum 1st highest[g]
Lead (Pb)	Quarterly	NA	1.5[h]	Maximum 1st highest[g]

a. IDAPA 58.01.01.006.91
b. Micrograms per cubic meter
c. IDAPA 58.01.01.577 for criteria pollutants
d. The maximum 1st highest modeled value is always used for significant impact analysis
e. Particulate matter with an aerodynamic diameter less than or equal to a nominal ten micrometers
f. Never expected to be exceeded in any calendar year
g. Concentration at any modeled receptor
h. Never expected to be exceeded more than once in any calendar year
i. Concentration at any modeled receptor when using five years of meteorological data
j. Not to be exceeded more than once per year

The two proposed generators are required to demonstrate compliance with the toxic air pollutant (TAP) increments with an ambient impact dispersion analysis for any TAP with a requested potential emission rate that exceeds the screening emission rate limit specified by IDAPA 58.01.01.585 or 58.01.01.586. Table 3 lists the applicable screening emission rates and regulatory limits (allowable increments) for the TAPs of concern for this project.

Table 3. TOXIC AIR POLLUTANTS APPLICABLE REGULATORY LIMITS

Pollutant	Averaging Period	Screening Emission Rate Limit[a] (lb/hr)[b]	Regulatory Limit (AAC/AACC)[c] ($\mu g/m^3$)[d]	Modeled Value Used[e]
1,1,2,2-Tetrachloroethane (CAS[f] # 79-34-5)	Annual	1.1E-05	1.7E-02	Maximum 1st highest[g]
1,1-Dichloroethane (ethylidene dichloride) (CAS# 75-34-3)	Annual	2.5E-04	3.8E-02	Maximum 1st highest[g]
1,1-Dichloroethylene (vinylidene chloride) (CAS# 75-35-4)	Annual	1.3E-04	2.0E-02	Maximum 1st highest[g]
1,2-Dichloroethane (ethylene dichloride) (CAS# 107-06-2)	Annual	2.5E-04	3.8E-02	Maximum 1st highest[g]
Acrylonitrile (CAS# 107-13-1)	Annual	9.8E-05	1.5E-02	Maximum 1st highest[g]
Dichloromethane (methylene chloride) (CAS# 75-09-2)	Annual	1.6E-03	2.4E-01	Maximum 1st highest[g]
Perchloroethylene (tetrachloroethylene) (CAS# 127-18-4)	Annual	1.3E-02	2.1E+00	Maximum 1st highest[g]
Trichloroethylene (CAS# 79-01-6)	Annual	5.1E-04	7.7E-01	Maximum 1st highest[g]
Vinyle chloride (CAS# 75-01-4)	Annual	9.4E-04	1.4E-01	Maximum 1st highest[g]
Benzene (CAS# 71-43-2)	Annual	8.0E-04	1.2E-01	Maximum 1st highest[g]

a. IDAPA 58.01.01.585 and 58.01.01.586
b. Pounds per hour
c. Increment for acceptable ambient concentration/acceptable ambient concentration for carcinogens
d. Micrograms per cubic meter
e. The maximum 1st highest modeled value is always used to establish TAPs compliance
f. Chemical abstract service
g. Concentration at any modeled receptor, never expected to be exceeded in any calendar year

2.2 Background Concentrations

Ambient background concentrations were revised for all areas of Idaho by DEQ in March 2003[1]. Background concentrations in areas where no monitoring data are available were based on monitoring data from areas with similar population density, meteorology, and emissions sources. Background concentrations used in these analyses are listed in Table 4. Background concentrations for Northern Ada County were used for background concentrations. Nitrogen oxides (NO_x), carbon monoxide (CO), PM_{10} and sulfur dioxide (SO_2) were included in the NAAQS modeling analyses. The TAPs increments do not have any ambient background concentrations.

DEQ recommended using the reduced value based on current ambient background isopleths for PM_{10}, rather than the value used in the original modeling demonstration for the HHSLF flares. Ambient background concentration for PM_{10} were reduced from 90 $\mu g/m^3$, 24-hour average to 73 $\mu g/m^3$, 24-hour average.

Table 4. BACKGROUND CONCENTRATIONS

Pollutant	Averaging Period	Background Concentration ($\mu g/m^3$)[a]
PM_{10}[b]	24-hour	73
	Annual	26
NO_2[c]	Annual	40
CO[d]	1-hour	12,249
	8-hour	6,754
SO_2[e]	3-hour	120
	24-hour	40
	Annual	10

a Micrograms per cubic meter
b Particulate matter with an aerodynamic diameter less than or equal to a nominal ten micrometers
c Nitrogen dioxide

3.0 MODELING IMPACT ASSESSMENT

3.1 Modeling Methodology

Table 5 provides a summary of the modeling parameters used in the DEQ verification analyses.

1 Hardy, Rick and Schilling, Kevin. *Background Concentrations for Use in New Source Review Dispersion Modeling.* Memorandum to Mary Anderson, March 14, 2003.

Table 5. MODELING PARAMETERS

Parameter	Description/Values	Documentation/Additional Description
Model	ISCS3-PRIME/BEE-LINE BEEST GUI[a] and ISCST3/BEE-LINE BEEST GUI	ISC3P Version 04629/BEEST Version 9.47 (short-term criteria air pollutants) and ISCST3 Version 02035/BEEST Version 9.47 (annual TAPs)
Meteorological data	1987-1991	Boise surface and upper air data
Terrain	Considered	Receptor 3-dimensional coordinates were obtained from USGS DEM files.
Building downwash	Downwash algorithm	Building dimensions obtained from modeling files submitted. DEQ re-ran the BPIP file using BPIP-Prime and then performed a sensitivity analysis using ISC-Prime. Predicted ambient impacts using ISC-Prime were lower than when using ISCST3, considering downwash.
Receptor grid	Grid 1	50m spacing along property boundary
	Grid 2	100m spacing out to 1000 meters
	Grid 3	500m spacing out to 5000 meters
	Grid 4	100m spacing within active landfill cell, access road, and private property within the Ada County HHSLF boundary.

[a] Graphic user interface

3.1.1 Modeling Protocol

A protocol was submitted by CH2M HILL, on behalf of G2 Energy, to DEQ prior to submission of the application, as required by IDAPA 58.01.01.213.01.c. Written approval of the modeling protocol, with comments on modeling methodology, was issued by Kevin Schilling, Modeling Coordinator, by email dated October 26, 2005. Modeling was conducted using methods and data presented in the modeling protocol and the *State of Idaho Air Quality Modeling Guideline*.

3.1.2 Model Selection

ISCST3 was used by G2 Energy to conduct the ambient air analyses. ISCST3 is the recommended model for this instance. The structures of concern included the hazardous waste collection building and the two proposed landfill gas-fired internal combustion engine and generator enclosures.

DEQ reviewed the effects of wind-induced downwash of these structures by running the modeling demonstration input file with BPIP-Prime and ISCS3-Prime for the criteria air pollutants with short-term averaging periods. This resulted in lower predicted ambient impacts when compared to G2 Energy's modeling demonstration results. This verifies that building downwash within recirculation cavities is not of concern for this project in order to predict conservative ambient impacts when the locations of the discrete receptors with regard to the emissions units are taken into account.

3.1.3 Meteorological Data

Boise surface and upper air meteorological data were used for the HHSLF site near Boise. Boise airport is the closest area where model-ready surface meteorological data are available. These data were used in the modeling analyses.

PCRAMMET, the meteorological data preprocessor for ISCST-3, occasionally generates unrealistically low mixing heights as a result of interpolation algorithms used with the twice daily measured mixing heights. DEQ verification modeling was conducted using meteorological data corrected for low mixing heights. All mixing height values below 50 meters were replaced with a value of 50 meters.

3.1.4 Terrain Effects

The modeling analyses submitted by G2 Energy considered elevated terrain. The actual elevation of each receptor was determined using United Geological Survey (USGS) digital elevation map (DEM) files.

DEQ reduced the base elevations for the generators by 65 feet to match the facility plot plan in Figure 2 of the application materials in the verification run for criteria air pollutants with short-term averaging periods.

3.1.5 Facility Layout

DEQ verified proper identification of the facility boundary and buildings on the site by comparing the modeling input to a facility plot plan and aerial photographs of the area submitted with the application. The facility layout is consistent with the layout used in the HHSLF modeling demonstration for the existing landfill gas-fired flares (Ada County, PTC No. P-040004, issued June 15, 2004).

3.1.6 Building Downwash

Plume downwash effects caused by structures present at the facility were accounted for in the modeling analyses. The Building Profile Input Program (BPIP) was used by the applicant to calculate direction-specific building dimensions and Good Engineering Practice (GEP) stack height information from building dimensions/configurations and emissions release parameters for ISCST3.

DEQ's verification analysis used the BPIP-Prime algorithm to verify that structure-induced downwash was not a concern in addition to the BPIP algorithm. ISCST3-Prime was run using the results of the BPIP-Prime algorithm. No significant differences in predicted ambient impacts were observed between the BPIP/ISCST3 and BPIP-Prime/ISCS3-Prime runs. DEQ's verification analysis results presented in this memorandum are based both on BPIP/ISCST3 and BPIP-Prime/ISCS3-Prime programs.

3.1.7 Ambient Air Boundary

G2 Energy utilized the same ambient air boundary as Ada County HHSLF used for the permitting analysis for the construction of the two enclosed landfill gas flares. DEQ approved the use of the HHSLF ambient air boundary for this project. Public access is restricted by a fence around the landfill gas-fired flares and generators.

3.1.8 Receptor Network

The receptor grids used by G2 Energy met the minimum recommendations specified in the *State of Idaho Air Quality Modeling Guideline*. DEQ verification analyses were conducted using the same receptor grid.

The location of the existing enclosed flares and proposed landfill gas-fired generators is surrounded by a fence. Public access is restricted by the fence. Public access into the active landfill cell and the hazardous waste collection facility is permitted. To account for this, G2 Energy's modeling demonstration included discrete receptors at the boundaries of the active landfill cell, within the landfill cell, and along the access road extending from Seaman Gulch Road to the hazardous waste collection facility and the landfill cell. Discrete receptors were also placed along and within parcels of private property that are located inside of the property controlled by Ada County.

3.2 *Emission Rates*

Emissions rates used in the dispersion modeling analyses submitted by the applicant were reviewed against those in the permit application. The following approach was used for DEQ verification modeling:

- All modeled criteria and toxic air pollutant (TAP) emissions rates were equal to or greater than the G2 Energy facility's emissions calculated in the PTC application or the permitted allowable rate.

- The two existing landfill gas-fired flares were modeled at the maximum firing rate, air pollutant emissions rates, exhaust flow rates, and temperatures, taking into consideration that the proposed landfill gas-fired generators will consume up to 25% of the total landfill gas collected. Therefore, the flares were modeled at 75% of the total quantity of landfill gas predicted to be generated in the analysis for PTC No. P-040004, which was issued on June 15, 2004, to HHSLF, Ada County. The quantity is approximately 3000 standard cubic feet per minute (scfm) for both flares combined, or 1500 scfm, individually.

Table 6 lists criteria air pollutant emissions rates for sources included in the dispersion modeling analyses. Daily emissions were modeled by G2 Energy for 24 hours. Annual emissions were modeled over 8,760 hours per year.

Table 6. MODELED CRITERIA EMISSIONS RATES

Source Id	Description	Emission Rates (lb/hr[e])			
		PM_{10}[a]	NO_2[b]	SO_2[c]	CO[d]
GEN1	Proposed generator 1	1.45	4.92	0.20	12.31
GEN2	Proposed generator 2	1.45	4.92	0.20	12.31
FLARE1	Existing enclosed flare 1	0.03	0.05	0.60	0.16
FLARE2	Existing enclosed flare 2	0.03	0.05	0.60	0.16

a. Particulate matter with an aerodynamic diameter less than or equal to a nominal ten micrometers
b. Nitrogen dioxide
c. Sulfur dioxide
d. Carbon monoxide
e. Pounds per hour

Table 7 lists the modeled TAP emissions rates for the two proposed generators. The landfill gas-fired flares are not subject to pre-construction TAPs compliance for this project. Daily emissions were modeled by G2 Energy for 24 hours. Annual emissions were modeled over 8,760 hours per year.

Table 7. MODELED TOXIC AIR POLLUTANT EMISSIONS RATES

Pollutant	Generators 1 and 2 Emission Rate (each unit)		Project Emissions Rate (lb/hr)	Project Emissions Rate (T/yr)
	(lb/hr)[a]	(T/yr)[b]		
1,1,2,2-Tetrachloroethane (CAS[r] # 79-34-5)	0.00305	0.0134	0.0061	0.0267
1,1-Dichloroethane (ethylidene dichloride) (CAS# 75-34-3)	0.0038	0.0166	0.0076	0.0333
1,1-Dichloroethylene (vinylidene chloride) (CAS# 75-35-4)	0.0003	0.0013	0.0006	0.0026
1,2-Dichloroethane (ethylene dichloride) (CAS# 107-06-2)	0.00065	0.0028	0.0013	0.0057
Acrylonitrile (CAS# 107-13-1)	0.00705	0.0309	0.0141	0.0618
Dichloromethane (methylene chloride) (CAS# 75-09-2)	0.0199	0.0872	0.0398	0.1743
Perchloroethylene (tetrachloroethylene) (CAS# 127-18-4)	0.01015	0.0444	0.0203	0.0889
Trichloroethylene (CAS# 79-01-6)	0.00605	0.0265	0.0121	0.0530
Vinyl chloride (CAS# 75-01-4)	0.0075	0.0329	0.015	0.0657
Benzene (CAS# 71-43-2)	0.00315	0.0138	0.0063	0.0276

a. Pounds per hour
b. Tons per year

3.3 Emission Release Parameters

Table 8 provides emissions release parameters, including stack height, stack diameter, exhaust temperature, and exhaust velocity. Values used in the analyses appeared reasonable and within expected ranges. Additional documentation /verification of these parameters were not required.

Each landfill gas-fired generator engine stack is equipped with a raincap which will impede the vertical momentum of the exhaust plumes. The vertical gas flow velocity was set at 0.001 meters per second (m/sec) for these emissions units.

Table 8. STACK PARAMETERS

Release Point	Source Type	Stack Height (m)[a]	Modeled Diameter (m)	Stack Gas Temp. (K)[b]	Stack Gas Flow Velocity (m/sec)[c]
GEN1	Point	5.18	0.432	763.2	0.001
GEN2	Point	5.18	0.432	763.2	0.001
FLARE1	Point	12.19	3.048	1144.3	0.13
FLARE2	Point	12.19	3.048	1144.3	0.13

a. Meters
b. Kelvin
c. Meters per second

3.4 *Results for Full Impact Analyses*

A significant contribution analysis was not submitted for this application. G2 Energy submitted a full impact analysis for the two proposed landfill gas-fired generator engines and the existing landfill gas-fired flares owned and operated by Ada County's HHSLF. Fugitive PM_{10} emissions from road dust, landfill activities, woodwaste chipping and screening sources, and point source emissions resulting from two distillate fuel-fired generators operating at the HHSLF were not modeled for this pre-construction NAAQS compliance demonstration. DEQ only required the existing flares to be modeled for this project due to the close proximity of the flares to the proposed landfill gas-fired generators.

Results of G2 Energy's submitted full impact analyses and DEQ's verification analyses are shown in Table 9. As shown, DEQ's 24-hour verification analyses indicated lower impacts than G2 Energy's analyses, perhaps due to better quantification of the effects of structure-induced downwash with the use of the Prime downwash algorithm and the alteration of unrealistically low mixing heights to a value 50 meters. Short-term criteria air pollutants and annual TAPs analyses were re-run and DEQ's verification analyses corresponded well to those presented by G2 Energy. The annual operating scenarios were not re-run by DEQ.

Table 9. RESULTS OF FULL IMPACT ANALYSES

Pollutant	Averaging Period	Modeled Design Concentration ($\mu g/m^3$)[a]	Background Concentration ($\mu g/m^3$)	Total Ambient Impact ($\mu g/m^3$)	NAAQS[b] ($\mu g/m^3$)	Percent of NAAQS
PM_{10}[c]	24-hour	17.47 (13.5, 10.1)[g]	73	90.5	150	60.3%
	Annual	1.31	26	27.3	50	54.6%
SO_2[d]	3-hour	26.83 (26.83, 21.49)	1200	146.83	1,300	11.3%
	24 hour	703 (7.00, 6.07)	40	47.03	365	12.9
	Annual	0.69	10	10.69	80	13.4%
CO[e]	1-hour	1,748.25 (2336.9, 1715.8)	12,249	13,997	40,000	35.0%
	8-hour	309.60 (306.9, 261.8)	6,754	7,063.6	10,000	70.6%
NO_2[f]	Annual	4.40	40	44.4	100	44.4%

a. Micrograms per cubic meter
b. National ambient air quality standards
c. Particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers
d. Sulfur dioxide
e. Carbon monoxide
f. Nitrogen dioxide
g. Values in parentheses were obtained from DEQ verification modeling using BPIP-Prime/ISC-Prime, first value is the highest first high, second value is the regulatory design concentration, which is the highest 6th high for PM_{10}, 24-hour average, the highest 2nd high for SO_2 and CO for 1-, 3-, 8-, and 24-hour averages. Annual averages use a design concentration of highest 1st high. G2 Energy's values are all highest 1st highs.

Table 10 lists the maximum predicted TAP ambient impacts presented by G2 Energy and the results of DEQ's verification analyses for the two proposed landfill gas-fired generators. DEQ's verification analyses were determined using BPIP/ISCST3 after DEQ verified that structure-induced downwash was not an issue for this project. The results of DEQ's verification analyses correspond well to the values presented by G2 Energy. All predicted TAP ambient impacts are below the applicable AACCs.

Table 10. TOXIC AIR POLLUTANTS ANALYSIS RESULTS

Pollutant	Year	Averaging Period	Maximum Concentration ($\mu g/m^3$)	Receptor Location				Percent of Limit
				East (m)	North (m)	Elevation (m)	AAAC ($\mu g/m^3$)	
Carcinogenic TAPs								
1,1,2,2-Tetrachloroethane	1988	Annual	0.00299 (0.00291)[a]	558192.3	4838182	894.6	0.017	17.6%
1,1-Dichloroethane	1988	Annual	0.00367 (0.00363)	558192.3	4838182	894.6	0.038	9.7%
1,1-Dichloroethylene	1988	Annual	0.00031 (0.00029)	558192.3	4838182	894.6	0.02	1.6%
1,2-Dichloroethane	1988	Annual	0.00064 (0.00062)	558192.3	4838182	894.6	0.038	1.7%
Acrylonitrile	1988	Annual	0.00679 (0.00673)	558192.3	4838182	894.6	0.015	45.3%
Dichloromethane	1988	Annual	0.0192 (0.019)	558192.3	4838182	894.6	0.24	8.0%
Perchloroethylene	1988	Annual	0.00977 (0.00969)	558192.3	4838182	894.6	2.1	0.5%
Trichloroethylene	1988	Annual	0.00585 (0.00578)	558192.3	4838182	894.6	0.77	0.8%
Vinyl chloride	1988	Annual	0.00724 (0.00716)	558192.3	4838182	894.6	0.14	5.2%
Benzene	1988	Annual	0.00302 (0.00301)	558192.3	4838182	894.6	0.12	2.5%

[a] Values in parentheses are DEQ verification analysis results, highest 1st high

4.0 CONCLUSIONS

The ambient air impact analysis submitted, in combination with DEQ's verification analyses, demonstrated to DEQ's satisfaction that emissions from the facility, as represented by the applicant in the permit application, will not cause or significantly contribute to a violation of any air quality standard.